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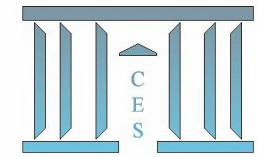

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Reconsidering Corporate Ratings

Bertrand Hassani*and Xin Zhao†

Abstract

In this paper, a new corporate ratings methodology is proposed. In this innovating approach corporate ratings are calibrated from data with different frequency in two-steps. Information of firms' credit quality from annual accounting ratios and daily credit derivative spreads yields are combined through a Bayesian approach. To test the performance of this new rating, an empirical analysis is carried out on a sample of 197 public traded international corporations with credit ratings from the big-three credit rating agencies. The ratings generated from the presented approach perform better than the ratings from the external agencies as it is more representative of companies' credit quality over time, therefore this approach is a suitable alternative to internal rating methods.

JEL: C23; E44; G15
Keywords: Corporate Rating, Market Implied Rating, Corporate Bond Yields.

1 Introduction

Credit risk is the risk that counterparts default on their obligations, i.e. the risk that a debtor cannot fulfill his repayment obligations. Credit events include the loss of the principal, the default on interest, cash flows disruption or cost escalation. The losses related to credit events vary in amounts and causes. For example, a company which fails to pay one of it's employee on the due date for special reason is mechanically considered as default. Therefore, the occurrence of a credit event is not necessarily an evidence of the risk of the investment. In order to limit the risk of losing the money to potentially lent to borrowers, sovereigns, companies, etc, a bank should undertake various verifications and evaluate the potential loss engendered by potential credit events.

Corporate ratings represent key factors for financial institutions to evaluate the credit risk of investing in the rated companies. In the global financial markets, external corporate ratings are issued by credit rating agencies (CRAs). Among the CRAs, the top three (i.e. Moody's, S&P's and Fitch's Rating) occupy more than 95% of the market. The power of CRAs has been showed during the last decade, where the ratings have been applied as a global benchmark of corporate credit risk. For instance, it has been required by Basel II for the calculation of credit capital requirement for certain banks (BIS (1996)[4]). Nevertheless, the late and slow reaction to the default of Enron, Worldcom and Lehman Brother undermined the trust of their ratings from people who relied on them to make investment decisions. The inherent conflict of interesting in the credit rating industry exhibited by Becker and Milbourn (2011)[6] and Bolton *et al.* (2012)[9] implies many questions on the CRAs. The credit rating crisis of 2007-2008 raised the doubts on CRAs' credibility. Evidence of "rating shopping" shadowed their reputation (Benmelech and Dlugosz (2010)[7]). Credit risk matters to everyone in the market. Thus, corporate ratings should be precise and accurate. The new regulation and supervision authorities require more prudent rating methodologies (BIS(2011)[5]). Investors, entrepreneur, financial institutions have been relying on and will still rely on credit ratings to make decisions even though the external ratings have been criticised and doubted for long (White (2010)[29]). Trustable evaluations of the creditworthiness of corporations are required by the fast growing market. Therefore, the purpose of this paper is to introduce a new approach which improves the traditional corporate rating methodology and furthermore provides useful credit references to market

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practitioners.

Two branches of studies have been built up for corporate ratings in literature, the accounting-data-based approach and the market-data-based approach. The first one (the traditional approach) is based on fundamental analysis using accounting data. Altman (1968)[1] introduce the Z-Score model that build the relationship between accounting data and corporate credit quality. Lo (1986)[25] and Altman *et al.* (1994)[2] extend the analysis to logit models. Kim and Sohn (2008)[23] apply the random effects model for the study of credit rating. The advantages of this approach are intuitive and based on fundamentals. The main drawbacks are the data limitation and time delay. It cannot adjust to or reflect updated information (Heflin *et al.* (2011)[18]). Financial statements reflect what happened in the past, while market prices are forward looking. An appealing corporate rating, however, should be consistent with the market, such that it will neither bring surprises nor be completely anticipated. Therefore, market-data-based approach arose during the last decades. Ederington *et al.* (1987)[14] measure the influence of ratings on bond yields; Hull *et al.* (2004)[20] examine the theoretical relationship among bond yields, CDS spreads and credit rating; Micu *et al.* (2004)[26] study the link between ratings and CDS using event study method; Daniels and Jensen (2005)[13] use principal component analysis, regression and event study methods to study the relation of CDS spreads, credit spreads and credit rating; Jorion and Zhang (2007)[22] discuss the effect of ratings on stock prices; Flannery *et al.* (2010)[15] and Hart and Zingales (2011)[17] suggest that CDS spreads are substitutes of credit ratings; Chen *et al.* (2013) control difference in default risk which are not captured by ratings by a "distance to default" measure according to the Moody's KMV^{TM} default prediction model with a large data set of CDS spreads. This approach picks up more subtle and fast-moving changes of credit relevant data, such that market sentiment delivered through market data can be captured. The drawback is that the stability of ratings may be impaired regarding the higher volatility of market information. Nevertheless, considering the fact that investors prefer to minimise transition costs, rating stability is desired and important. In sum, these two approaches are both based on valuable information of corporate credibility. Each of them has pros and cons. Past analysis proved the importance of both resources of information. The natural of the data frequency, however, brings the difficulty to combine them. The contribution of this paper is to introduce a new approach to combine these two information sets. Using this new approach, we can provide better corporate ratings as more reliable, subjective, efficient, and stable.

As we mentioned, the frequency difference of the accounting data and market data causes the fact that it is difficult to put them in a single model. The solution suggested is to evaluate the credit score from the two information sets separately, and then combine them through credibility theory. To test the performance of this new approach, an empirical study is carried out in two steps. In the first step, a sample of accounting data and market values of the corporations rated by the three major CRAs is collected for the study. These data are used to explore the relationships between accounting data, market data and ratings. In the second step, the new ratings averaged from the accounting ratings and CDS ratings are compared to the CRAs' ratings. This approach has several advantages compared to the traditional ones. The low frequency accounting data and the timeless market data are combined in the estimates which make a rating reflecting both fundamental and market sentiment. Secondly, credibility weight are given to accounting-data-based ratings and market-price-based ratings with respect to the variance of the two ratings in order to obtain a relatively stable rating framework.

The paper is organised as follows. Methodologies of accounting-data-based and market-price-based ratings are expressed in the next section. The algorithm to calculate the weights is also given in Section 2. Our empirical analysis is exhibited in Section 3, while a fourth section concludes.

2 Methodology

This section introduces the methodology to combine market and accounting data to evaluate the credit quality of a company. Table 2 presents the mapping to transform the rating letters[1] into numeric values, labeled as credit scores in this context. Credit scores mapped from the external ratings represent the corporate credit quality evaluated by the CRAs. The notations used in the model are: R_δ, R_{Acc} and R_{CDS}, which refer to the final ratings, accounting ratings and CDS ratings respectively; S_δ, S_{Acc} and S_{CDS}, which refer to the final score, accounting score and CDS score.

The objective is to assign appropriate credit scores to companies in order to generate fair ratings. A two-steps approach combining the information obtained from the two data sources is proposed to meet the needs. The underlying idea is a weighted average of the credit score obtained from the two sets of information, as exhibited in the following model:

$$S_{\delta,i} = w_i \cdot S_{Acc,i} + (1 - w_i) \cdot S_{CDS,i} \tag{1}$$

where $S_{\delta,i}$ is the weighted average of credit scores of corporation i implied from accounting data and CDS data; $S_{Acc,i}$ and $S_{CDS,i}$ are the credit scores of corporation i derived from accounting and CDS data; and w_i is the weight given to the two basic credit scores.

Accounting Score

According to reports published by the largest CRAs (Samson, S. B. (2008)[27], Cantor *et al.* (2002)[12], and Hunter *et al.*(2013)[21]), accounting data is the fundamental resource of their quantitative rating methodologies[2]. In literature, models based on accounting ratios have been proposed to evaluate the credit risk. On the other hand, CRAs' ratings have been proved can be explained by the accounting ratios. Based on previous researches, we calibrate the credit score based on accounting data in this subsection.

$S_{Acc,i}$ in equation (1) is a function of the accounting ratios, e.g. $S_{Acc,i} = f(Acc_i)$, where Acc_i is a matrix of accounting data. Accounting ratios relevant to companies' credit quality include leverage ratios, debt ratios, liquidity ratios, activity ratios, and profitability ratios (Table 4). Previous studies in this field covered potential models based on linear regression, cross-sectional regression, panel regression, logistic regression and probit regression, etc. The choice of both the methodology and the accounting variables are mainly based on empirical analysis of the explanatory power to history default probability. In the empirical study, we firstly recalibrate CRAs' quantitative rating methodology. Different models are tested to find the best model to calculate the accounting data based credit scores. Then, the accounting data based credit scores are calculated using the best performance model.

Market Score

There are three alternatives of market information reflecting corporate credit quality: bond markets, equity markets or CDS markets. Among the three potential market information for credit quality of the underlying entities, CDS are considered as a better proxy than bond and equity prices which are intrinsically biased (Norden and Weber (2004) and Hull et al. (2004)). CDS spreads implied credit ratings can quickly adjust themselves to changes in the market (Acharya and Johnson (2007)).

Theoretically, CDS spreads represent pure credit risk. However, in practice there are evidences showing that this does not hold in general. The reason of the variation include liquidity, risk appetite, etc. Scneider et al. (2007) find evidence that equity market volatility measured by the VIX index influence the valuation of the CDS. Callen et al (2007) proved that CDS prices are not only decided by the credit

[1]Since the standard corporate ratings issued by the CRAs are in the alphabetic format, we need to map these letters to the values which can be used in the study.

[2]Business risk and corporation governance quality are taken into consideration as part of qualitative criteria.

quality of the corporation but also by the liquidity of the product and others marginal factors. Therefore, market risk and liquidity risk premiums are considered at that level. In this study, we follow Fitch's market implied rating approach. CDS values are used as a matrix of the credit quality of the company to derive market implied rating. The approach is extended to filter the market and liquidity risk premium using relevant market information.

$S_{CDS,i}$ is a function of the market data, e.g. $S_{CDS,i} = g(CDS_i)$, where CDS_i is a matrix of the CDS relevant market data of company i. The basic relationship is: higher CDS implied credit scores are assigned to the companies with lower CDS values. CDS values are the filtered value of CDS daily prices with respect to liquidity and market risk premia. The spectrum of the corresponding CDS implied credit scores are calibrated based on the history relationship with the CRAs' rating scores.

Weight and δ Score

The "δ-Rating" is obtained through the average of the accounting data based ratings and market implied ratings using the credibility weight ω. Bühlmann-Straub method[3], the most extensively used and important model in credibility theory, is applied to compute the weight ω (Bühlmann and Alois(2005)).

Theorem 1 (Bühlmann-Straub)**.** *The credibility estimator μ in the simple Bühlmann-Straub model:*

A.1 The random variables X_{kj} $(j = 1, \ldots, n)$ are, conditional on $\Theta_k = \vartheta$, independent with the same distribution function F_ϑ and conditional moments

$$\mu(\vartheta) = E[X_{kj}|\Theta_k = \vartheta],$$
$$\sigma^2(\vartheta) = Var[X_{kj}|\Theta_k = \vartheta].$$

A.2 The pairs (Θ_1, X_1), ..., (Θ_K, X_K) are independent and identically distributed.

is given by

$$\mu \quad = \quad \omega\overline{X_i} + (1-\omega)\overline{X} \tag{2}$$

where

$$\omega = \frac{n}{n + \frac{\sigma^2}{\tau^2}}, \qquad \sigma^2 = E[\sigma^2(\Theta)], \quad \tau^2 = Var(\mu(\Theta)). \tag{3}$$

$$\overline{X_i} = \frac{1}{n}\sum_{j=1}^{n} X_{i,j} \qquad \overline{X} = \frac{1}{Kn}\sum_{i=1}^{K}\sum_{j=1}^{n} X_{ij}$$

Practically, in our case, $\overline{X_j}$ is the rating implied by the market information and $\overline{X}$ is the fundamental rating estimated through accounting data. Moreover ω is the weight given to market implied rating and lead to the"$\delta-$rating", as it is the weighted average of the two previous components.

δ Rating

For the exact same reason mentioned above, the numbers to the letters to give the ratings comparable to the CRAs' ratings need to be transferred. The ratings from these scores are given by the following mapping:

$$R_\delta \text{ (or } R_{Acc} \text{ or } R_{CDS}) = \begin{cases} \text{AAA(Stable)} & if \quad s_0 < S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_1 \\ \text{AAA(Negative)} & if \quad s_1 < S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_2 \\ \text{AAA(Watch Negative)} & if \quad s_2 < S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_3 \\ \vdots & \\ \text{D(Stable)} & if \quad s_{n-1} < S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_{n-2} \\ \text{D(Negative)} & if \quad s_n < S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_{n-1} \\ \text{D(Watch Negative)} & if \quad S_\delta \text{ (or } S_{Acc} \text{ or } S_{CDS}) \leq s_n \end{cases}$$

[3]This approach is also called empirical Bayesian method

where $s_0, s_1, \cdots, s_n$ are given in Table 3.

3 Empirical Study

In this section, a sample of accounting and market data from 197 public traded companies who are rated by the CRAs and with market data available are collected. These 197 companies are selected from 30 countries worldwide, and cover 35 segments of industry[4].

In the first step, we use the data to recalibrate the CRAs' quantitative credit scoring model. Then, the accounting data based credit scores and market data based credit scores are derived from the sample. Finally, the δ rating are calculated and compared with the CRAs' ratings.

Accounting Data and Scores

Ratios in Table 4 of the selected 197 corporations are collected from Datastream, which is from 2004 to 2011 on annually basis. For each group of ratio, the accounting ratio with best data quality[5] are selected. Leverage ratio is calibrated by liabilities/assets; debt ratio equals total debt/total assets; liquidity ratio equals current asset/liabilities; profitability ratio equals EBIT/assets. Table 6 exhibits statistics of the whole period and sub-period from 2004-2007, and 2008-2011. Table 7 shows statistics of whole sample, and sub-sample of investment and non-investment grade[6] companies' financial ratios. The results support the hypothesis relations listed in Table 4, except for activity ratio. The investment grade corporations have lower leverage and debt ratio, higher liquidity and profitability ratio, and bigger size. There is no significant difference of the growth rate between the two groups.

To recalibrate CRAs' quantitative rating model, different regression approaches are applied to the sample. The results of the methods are summarized in Table 8 and 9. The $p-$values and the adjusted R^2-values indicate that the accounting data can explain around 30% to 50% of the ratings issued by the CRAs with the simple linear regression. Yet, with logit and probit regression, the explanation power decrease sharply to less than 10%. This observation is consistent with the rating methodologies announced by the CRAs. Their reports state that they assign the rating according to the ordinary level of the ratios, which is closer to linear regression than other regression models. Besides, after 2007 accounting ratios give better explanation to ratings than before in terms of higher adjusted R^2-values. It indicates that the CRAs rely more on the fundamental data than other factors since the start of the crisis.

There is a clear break point for the influence of leverage ratio. Before the year 2007, the higher leverage is considered as a positive sign for the credit quality. Whereas since the crisis, which was blamed for excessive leverage, the high leverage is considered as the factor of credit quality with a negative symbol. Activity ratio, profitability ratio and size played as a positive factor for corporation credit quality through the eight years. Debt ratio had negative sign from 2004 to 2008, but the sign changed to positive after 2009. The interpretation is that during and after the crisis, only those bigger and stronger corporations are able to financing themselves trough raising debt. The companies with weaker credit quality are either forced to reduce their total debt or delist because of the capital chain break. Liquidity ratio show positive sign from 2004 to 2009 but statistically insignificant. After 2010, it had positive sign and significant at 2011. This result is ambiguous. As we known, the new Basel regulation increased the requirement of liquidity ratio for banks. Even through it is not implemented for corporations, there are many cases of bankruptcy during the crisis because of the insufficient cash flow. The inconsistence of this regression results with the fact in the market bring the doubt on the accuracy of the ratings given by the credit rating agencies. Finally, influence of growth rate is not consistent through the years. It is reasonable, because the growth rate depends on the development stage and industry of the corporations which is not

[4]The list of countries and industries are given in Table 4.

[5]Best quality in terms of less missing value and outliers.

[6]A corporation is considered investment grade if its rating is BBB- or higher by Standard & Poor's and Fitch's or Baa3 or higher by Moody's or BBB(low).

necessarily linear related to the credit quality of the corporation.

To test whether there is difference between the ratings given to investment grade and non-investment grade corporations, we do the same regression to the two sub-groups of the data. The results are listed in Table 10, 11, 12, and 13. There is no significant difference. Moreover, the results of panel regression with pooling, fix effect, random effect, and logit and probit methods are tabulated in table 14. With the simple pooling regression method, the panel data of financial ratios can explain around 30% of the CRAs' ratings. The R^2 of fixed effect, logit and probit regressions are much smaller, which indicate that the CRAs do not consider the difference in business practices across companies, neither non-linear relation between the accounting ratios and credit quality of the corporations. The R^2 of random effect panel regression is around 30% which means that there the ratings measure the changes over time but not across entities. Compare the results between the year 2004-2006 and 2007-2011, there is a clear evidence that the world switched from a leveraging to a deleveraging. Besides, the influence of liquidity ratio is insignificant through the whole period, which indicate that this important credit variable has not been paid enough attention by the CRAs. Across the 8 years, debt ratio showed negative sign; profitability, activity and size are considered as a good signal; the influence of growth rate is still undefined.

To calculate the accounting data based ratings for the year 2012 and 2013, we collected the same ratios for the sample and use the linear regression model with the data from 2007-2011 to estimate the accounting data based credit scores. The forecast scores using the accounting data are compared with the credit scores CRAs' ratings. Figure 1 plots the accounting data based scores against the S&P's rating scores for year 2012 and 2013. Table 16 summaries the difference between the S&P's rating scores and the forecasted rating scores. The results show that accounting based scores are higher than the S&P's rating scores at the lower range of credit scores which corresponding to the category of non-investment grade ratings. For the investment grade ratings, at the higher range of credit scores, accounting based scores are lower than the S&P's rating scores.

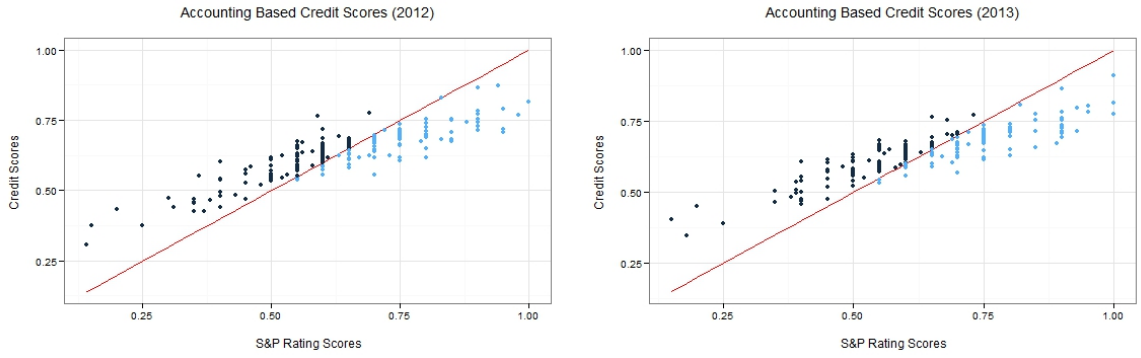

Figure 1: Accounting Data Based Credit Scores vs. S&P's Rating Scores

Market Data and Score

The selected companies' 5 year credit default swap (CDS) daily last price, bid and ask prices are collected from Bloomberg on from the 1st Jan. 2008 to 31th Dec. 2011. Table 15 show the statistics of the sample of CDS last, bid and ask prices by each rating groups according to the Moody's updated rating at the corresponding data collect date. If CDS prices reflect the credit risk of the corporations as the same way of the CRAs' ratings, then CDS of the reference entities with similar ratings should be priced similarly or vice versa. Ideally, there should be a clear spectrum where the entity with higher rating has lower CDS prices. The value in Table 15 indicates the level of CDS prices increase with lower ratings which shows a clear relation with market information and CRAs' ratings on an average level. However, there is not a clear boundary of the CDS value for each rating group. Figure 4 shows the evolvement of the CDS last, bid and ask price series through the time by each rating groups. Figure 5 show the average value

of the select companies' CDS daily last prices for each rating groups for the last six months' CDS data and ratings in 2013. A clear fact reflects from the time series plots is that CRAs' rating is an ordinary risk matrix rather than absolute risk estimation of the credit of the companies. The average CDS prices varies significantly through the three years period within each rating groups. On the one hand, the fact consistent with the CRAs' principle of issuing the "through the cycle ratings", on the other hand it reflects market are much more sensitive to the actual credit quality of the entities which serves better investors interesting.

To calculate the implied CDS rating of the selected companies. We collected a larger group of companies' 5 year CDS data to generate the spectrum of the CDS implied scores. Then, the data of 2012 and 2013 are applied to the generate the CDS implied credit scores. The results are show in Figure 2. Market data implied credit scores show the same trends as the accounting data implied credit scores. Generally, the non-investment grade rated companies' credit qualities are underestimated with reference to the CDS implied scores. On the other hand, the investment grade rated companies' credibility are overestimated. For each company, there are around 250 estimation point for the CDS implied credit scores. The companies with lower credit scores tends to have more volatile estimations, which impairs the stability of CDS implied ratings.

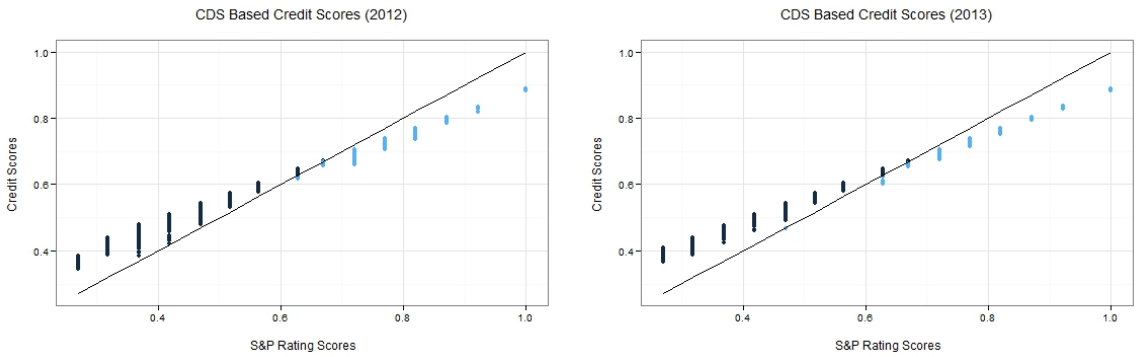

Figure 2: CDS Implied Credit Scores

δ-Rating

Based on the accounting data implied credit scores and CDS data implied credit scores, the weight w is calculated by equation 3. Thereafter, the weighted averaged score $S_{\delta,i}$ is computed for each company i. The accounting based credit scores, CDS implied scores, weights and δ-Score of period from July. 2013 to Dec. 2013 are summarized in Table 17 and exhibit in Figure 3. The CDS score is the average market implied $S_{CDS,i}$ for each company, accordingly τ^2 is calculated by the 6 months' variance. Since accounting based credit scores are much stable compared to CDS implied credit scores, higher weight w_i are given to $S_{Acc,i}$ (Table 17).

Generally, δ-Score follows the same trend as the S&P's rating scores. The disparity aggravates at the two tails. Taken S&P's rating scores as benchmark, $S_{Acc,i}$, $S_{CDS,i}$ and $S_{\delta,i}$ all indicate lower credit quality at the right tail and higher credit quality at the left tail for most companies. The cut-off line is around 0.55. According to S&P's rating scores (Table 2), this is coincident with the threshold of investment grate ratings. If a company has the score lower than 0.55, it will fall into the non-investment or "junk" investment rated groups. Since $S_{\delta,i}$ is the weighted average of $S_{Acc,i}$ and $S_{CDS,i}$, it is not surprising that the result follows the same feature as the accounting based credit score and CDS implied credit score. Nevertheless, $S_{\delta,i}$ is more updated compare to $S_{Acc,i}$ and more stable compare to $S_{CDS,i}$. Through the weight w, and the time period of calculating $S_{CDS,i}$ and w, the more frequent market information and less frequent fundamental information of the companies credibility are combined to have a relative stable and updated estimation. This approach provide the flexibility of updating the credit information of the

underlying entity and also abide by the fundamental information of the company.

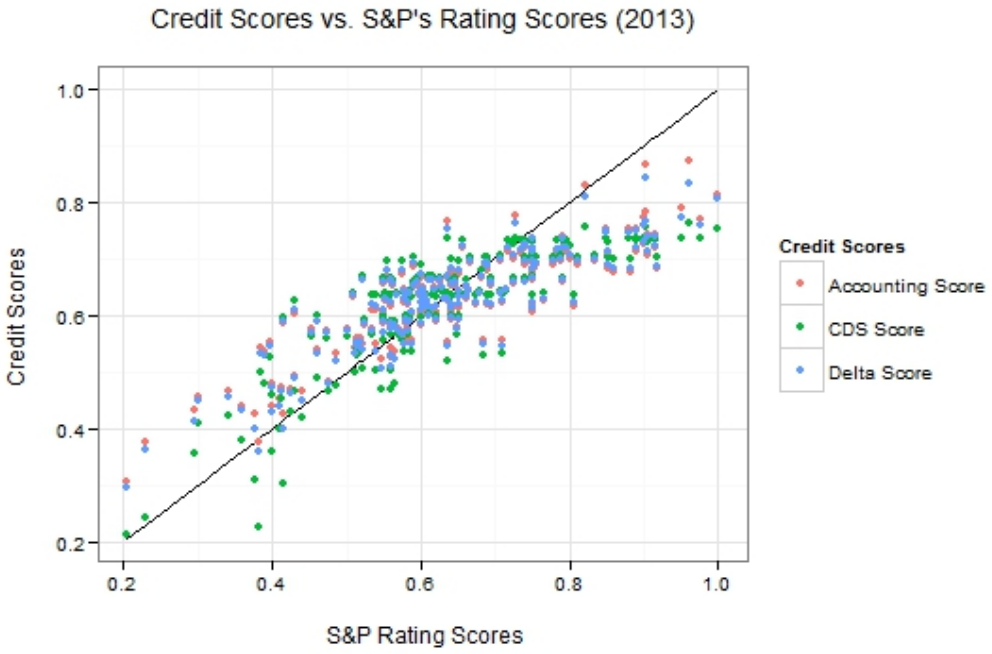

Figure 3: Credit Scores and S&P's Rating Scores

4 Conclusion

During last decades, credit rating agencies provided good service to financial market. They contributed to the growing of over the border investment and international investment. Unfortunately, the value of such their ratings has been questioned since the recent financial crisis. Criticism has been raised on the credibility of the ratings. No matter it is because of the potential conflict of interest to earn high fees for the issuers or the dated rating methodologies, the fact is the accuracy of their ratings are quite questionable. In this paper, we studied the corporate ratings through two difference approaches and propose a methodology to updating the credit information of the underlying entity and also abide by the fundamental information of the company.

There are several interested results have been discussed in this study. Firstly, the accounting data are used to recalibrate the CRAs' rating methodology. After testing all the potential models, we find the simple linear regression can provide the best explanation of their ratings using accounting ratios. The study also shows that the model needs to be updated after the 2007 where the affect of leverage has been changed for evaluating the credit quality of the company. Secondly, the CDS implied ratings are consistent as the CRAs' on an average level. The lower the CDS value, the higher the ratings of the entity. The diverse happens when it comes to the very high or low rated companies. This scenario is true for all the approaches which include the accounting data implied ratings, market data implied ratings and the δ-ratings. This finding can help to explain the cases when the highly rated "AAA" companies suddenly fallen into the bottom. But what is also interested is the underestimations on the other tails, which indicated the potential investment opportunities might be underrated.

In brief, the results consistently proved the bias of CRAs' ratings and provide several approaches to adjust the CRAs' ratings. It is true that only using quantitative modeling cannot capture the complex structure of the credibility of the companies, but the experts adjustments should follow the correct logic

and have strong rational rather than driven by the short-term benefits.

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S&P	Moody's	Fitch	
AAA	Aaa	AAA	Prime
AA+	Aa1	AA+	High Grade
AA	Aa2	AA	
AA-	Aa3	AA-	
A+	A1	A+	Upper Medium Grade
A	A2	A	
A-	A3	A-	
BBB+	Baa1	BBB+	Lower Medium Grade
BBB	Baa2	BBB	
BBB-	Baa3	BBB-	
BB+	Ba1	BB+	Non-Investment Grade Speculative
BB	Ba2	BB	
BB-	Ba3	BB-	
B+	B1	B+	Highly Speculative
B	B2	B	
B-	B3	B-	
CCC+	Caa1	CCC+	Substantial Risks
CCC	Caa2	CCC	
CCC-	Caa3	CCC-	
CC	Ca	CC	Extremely Speculative
C		C	
D	C	DDD	In Default
		DD	
		D	

Table 1: Rating Symbols of Standard & Poor's, Moody's and Fitch's Long-Term Ratings

1	AAA	Stable	0.67	BBB+	Watch Positive	0.34	B+	Negative
0.99	AAA	Negative	0.66	BBB+	Positive	0.33	B+	Watch Negative
0.98	AAA	Watch Negative	0.65	BBB+	Stable	0.32	B	Watch Positive
0.97	AA+	Watch Positive	0.64	BBB+	Negative	0.31	B	Positive
0.96	AA+	Positive	0.63	BBB+	Watch Negative	0.3	B	Stable
0.95	AA+	Stable	0.62	BBB	Watch Positive	0.29	B	Negative
0.94	AA+	Negative	0.61	BBB	Positive	0.28	B	Watch Negative
0.93	AA+	Watch Negative	0.6	BBB	Stable	0.27	B-	Watch Positive
0.92	AA	Watch Positive	0.59	BBB	Negative	0.26	B-	Positive
0.91	AA	Positive	0.58	BBB	Watch Negative	0.25	B-	Stable
0.9	AA	Stable	0.57	BBB-	Watch Positive	0.24	B-	Negative
0.89	AA	Negative	0.56	BBB-	Positive	0.23	B-	Watch Negative
0.88	AA	Watch Negative	0.55	BBB-	Stable	0.22	CCC	Watch Positive
0.87	AA-	Watch Positive	0.54	BBB-	Negative	0.21	CCC	Positive
0.86	AA-	Positive	0.53	BBB-	Watch Negative	0.2	CCC	Stable
0.85	AA-	Stable	0.52	BB+	Watch Positive	0.19	CCC	Negative
0.84	AA-	Negative	0.51	BB+	Positive	0.18	CCC	Watch Negative
0.83	AA-	Watch Negative	0.5	BB+	Stable	0.17	CC	Watch Positive
0.82	A+	Watch Positive	0.49	BB+	Negative	0.16	CC	Positive
0.81	A+	Positive	0.48	BB+	Watch Negative	0.15	CC	Stable
0.8	A+	Stable	0.47	BB	Watch Positive	0.14	CC	Negative
0.79	A+	Negative	0.46	BB	Positive	0.13	CC	Watch Negative
0.78	A+	Watch Negative	0.45	BB	Stable	0.12	C	Watch Positive
0.77	A	Watch Positive	0.44	BB	Negative	0.11	C	Positive
0.76	A	Positive	0.43	BB	Watch Negative	0.1	C	Stable
0.75	A	Stable	0.42	BB-	Watch Positive	0.09	C	Negative
0.74	A	Negative	0.41	BB-	Positive	0.08	C	Watch Negative
0.73	A	Watch Negative	0.4	BB-	Stable	0.07	D	Watch Positive
0.72	A-	Watch Positive	0.39	BB-	Negative	0.06	D	Positive
0.71	A-	Positive	0.38	BB-	Watch Negative	0.05	D	Stable
0.7	A-	Stable	0.37	B+	Watch Positive	0.04	D	Negative
0.69	A-	Negative	0.36	B+	Positive	0.03	D	Watch Negative
0.68	A-	Watch Negative	0.35	B+	Stable			

*This table shows the mapping from the standard alphabets ratings to the numerical credit scores.

Table 2: Ratings and Corresponding Scores

$[1, 0.995)$	AAA	Stable	$[0.675, 0.665)$	BBB+	Watch Positive	$[0.345, 0.335)$	B+	Negative
$[0.995, 0.985)$	AAA	Negative	$[0.665, 0.655)$	BBB+	Positive	$[0.335, 0.325)$	B+	Watch Negative
$[0.985, 0.975)$	AAA	Watch Negative	$[0.655, 0.645)$	BBB+	Stable	$[0.325, 0.315)$	B	Watch Positive
$[0.975, 0.965)$	AA+	Watch Positive	$[0.645, 0.635)$	BBB+	Negative	$[0.315, 0.305)$	B	Positive
$[0.965, 0.955)$	AA+	Positive	$[0.635, 0.625)$	BBB+	Watch Negative	$[0.305, 0.295)$	B	Stable
$[0.955, 0.945)$	AA+	Stable	$[0.625, 0.615)$	BBB	Watch Positive	$[0.295, 0.285)$	B	Negative
$[0.945, 0.935)$	AA+	Negative	$[0.615, 0.605)$	BBB	Positive	$[0.285, 0.275)$	B	Watch Negative
$[0.935, 0.925)$	AA+	Watch Negative	$[0.605, 0.595)$	BBB	Stable	$[0.275, 0.265)$	B-	Watch Positive
$[0.925, 0.915)$	AA	Watch Positive	$[0.595, 0.585)$	BBB	Negative	$[0.265, 0.255)$	B-	Positive
$[0.915, 0.905)$	AA	Positive	$[0.585, 0.575)$	BBB	Watch Negative	$[0.255, 0.245)$	B-	Stable
$[0.905, 0.895)$	AA	Stable	$[0.575, 0.565)$	BBB-	Watch Positive	$[0.245, 0.235)$	B-	Negative
$[0.895, 0.885)$	AA	Negative	$[0.565, 0.555)$	BBB-	Positive	$[0.235, 0.225)$	B-	Watch Negative
$[0.885, 0.875)$	AA	Watch Negative	$[0.555, 0.545)$	BBB-	Stable	$[0.225, 0.215)$	CCC	Watch Positive
$[0.875, 0.865)$	AA-	Watch Positive	$[0.545, 0.535)$	BBB-	Negative	$[0.215, 0.205)$	CCC	Positive
$[0.865, 0.855)$	AA-	Positive	$[0.535, 0.525)$	BBB-	Watch Negative	$[0.205, 0.195)$	CCC	Stable
$[0.855, 0.455)$	AA-	Stable	$[0.525, 0.515)$	BB+	Watch Positive	$[0.195, 0.185)$	CCC	Negative
$[0.845, 0.835)$	AA-	Negative	$[0.515, 0.505)$	BB+	Positive	$[0.185, 0.175)$	CCC	Watch Negative
$[0.835, 0.825)$	AA-	Watch Negative	$[0.505, 0, 495)$	BB+	Stable	$[0.175, 0.165)$	CC	Watch Positive
$[0.825, 0.815)$	A+	Watch Positive	$[0.495, 0.485)$	BB+	Negative	$[0.165, 0.155)$	CC	Positive
$[0.815, 0.805)$	A+	Positive	$[0.485, 0.475)$	BB+	Watch Negative	$[0.155, 0.145)$	CC	Stable
$[0.805, 0.795)$	A+	Stable	$[0.475, 0.465)$	BB	Watch Positive	$[0.145, 0.135)$	CC	Negative
$[0.795, 0.785)$	A+	Negative	$[0.465, 0.455)$	BB	Positive	$[0.135, 0.125)$	CC	Watch Negative
$[0.785, 0.775)$	A+	Watch Negative	$[0.455, 0.445)$	BB	Stable	$[0.125, 0.115)$	C	Watch Positive
$[0.775, 0.765)$	A	Watch Positive	$[0.445, 0.435)$	BB	Negative	$[0.115, 0.105)$	C	Positive
$[0.765, 0.755)$	A	Positive	$[0.435, 0.425)$	BB	Watch Negative	$[0.105, 0.095)$	C	Stable
$[0.755, 0.745)$	A	Stable	$[0.425, 0.415)$	BB-	Watch Positive	$[0.095, 0.085)$	C	Negative
$[0.745, 0.735)$	A	Negative	$[0.415, 0.405)$	BB-	Positive	$[0.085, 0.075)$	C	Watch Negative
$[0.735, 0.725)$	A	Watch Negative	$[0.405, 0.395)$	BB-	Stable	$[0.075, 0.065)$	D	Watch Positive
$[0.725, 0.715)$	A-	Watch Positive	$[0.395, 0.385)$	BB-	Negative	$[0.065, 0.055)$	D	Positive
$[0.715, 0.705)$	A-	Positive	$[0.385, 0.375)$	BB-	Watch Negative	$[0.055, 0.045)$	D	Stable
$[0.705, 0.695)$	A-	Stable	$[0.375, 0.365)$	B+	Watch Positive	$[0.044, 0.035)$	D	Negative
$[0.695, 0.685)$	A-	Negative	$[0.365, 0.355)$	B+	Positive	$[0.035, 0]p$	D	Watch Negative
$[0.685, 0.675)$	A-	Watch Negative	$[0.355, 0.345)$	B+	Stable			

*This table shows the mapping from numerical credit score between 0 to 1 to the standard alphabets ratings from D watch negative to AAA stable.

Table 3: Boundaries of Rating Scores to Rating Letters.

	Accounting Ratio	Correlation with Credit
Leverage Ratio	Liabilities/Assets	-
	Liabilities/Tangible Assets	-
	Long Term Liabilities/Assets	-
Debt Ratio	Total Debt/Total Assets	-
	EBIT/Interest Expense	+
Liquidity Ratio	Current Assets/Liabilities	+
	Quick Ratio[1]	+
Activity Ratio	Account Payable/Net Sale	-
Profitability Ratio	EBIT[1]/Assets	+
	EBIT/Net Sales	+
	Net Income/Assets	+
	Net Income/Operating Income	+
	Retained Earnings/Assets	+
Size	Asset/CPI[2]	+
Growth Rate[3]	Current Operating Income/Last Operating Income	+/-

Table 4: Financial Ratios

* In this table, we list the candidate accounting ratios examined in this study. Categories of the ratio are listed in the first column. Second column exhibits the formula. The relation between the ratio and the credit quality are given in the last column. For example, "+" means the increase in the ratio leads to the increase of the credit quality, or a better rating; "-" means the increase in the ratio leads to the decrease of the credit quality, or worse rating.

1. EBIT refers to earning before interest and tax.
2. CPI refers to consumer price index.
3. Growth rates reflect the development stage of the corporation.
4. FFO refers to funds from operation.
5. EBITDA refers to earning before inters, tax, depreciation and amortization.

Countries	
AUSTRALIA	LUXEMBOURG
BELGIUM	MALAYSIA
BRAZIL	MEXICO
CANADA	NETHERLANDS
CAYMAN ISLANDS	NEW ZEALAND
DENMARK	PORTUGAL
FINLAND	PORTUGAL
FRANCE	SPAIN
GERMANY	SWEDEN
HONG KONG	SWITZERLAND
INDIA	THAILAND
ISRAEL	UNITED ARAB EMIRATES
ITALY	UNITED KINGDOM
JAPAN	UNITED STATES
KOREA	VENEZUELA

Industries	
AIRCRAFT & AEROSPACE: EQUIPMENT	METALS & MINING
AUTOMOTIVE	NATURAL PRODUCTS PROCESSOR
CHEMICALS	NON-U.S. BANK
CONSTR & ENGINEERING SERV: HOMEBUILDING	PACKAGING: PLASTICS
CONSUMER PRODUCTS	PHARMACEUTICALS: GENERAL & SPECIALTY
DEFENSE	REINSURANCE
ENERGY	REIT
ENVIRONMENT	REOC
FINANCE-CAPTIVE	RESTAURANTS: FAST FOOD
FINANCE-NON CAPTIVE	RETAIL
FOREST PRODUCTS: PULP & PAPER	SECURITIES HOLDING CO.
GAMING: CASINOS	SERVICES
HEALTHCARE	TECHNOLOGY
INSURANCE	TELECOMMUNICATIONS
LODGING	TRANSPORTATION SERVICES
MANUFACTURING	U.S. BANK HOLDING CO.
MEDIA	UTILITY
	WHLSL DSTRBTN: HEALTHCARE

Table 5: Country and Segment coverage of Sample Data

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,004	1	0.140	0.010	0.010	0.001	0	-0.801	8,206	0.220
1st Qu.	2,006	50	0.550	0.142	0.130	0.077	0.013	0.033	96,220	0.908
Median	2,008	99	0.615	0.251	0.245	0.140	0.044	0.068	223,500	1.046
Mean	2,008	99	0.638	0.269	0.260	0.218	0.091	0.072	3,696,000,000,000	1.070
3rd Qu.	2,009	148	0.750	0.381	0.363	0.288	0.103	0.110	599,400	1.184
Max.	2,011	197	1	0.883	0.940	0.999	0.989	0.537	324,000,000,000,000	4.139

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,004	1	0.200	0.010	0.010	0.002	0	-0.300	8,206	0.291
1st Qu.	2,005	50	0.550	0.101	0.164	0.070	0.014	0.045	92,150	0.979
Median	2,006	99	0.650	0.209	0.269	0.129	0.044	0.079	210,200	1.090
Mean	2,006	99	0.652	0.230	0.282	0.206	0.094	0.085	3,449,000,000,000	1.129
3rd Qu.	2,006	148	0.750	0.330	0.378	0.288	0.109	0.119	562,600	1.214
Max.	2,007	197	1	0.876	0.940	0.995	0.968	0.537	324,000,000,000,000	4.139

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,008	1	0.140	0.010	0.010	0.001	0.00000	-0.801	8,386	0.220
1st Qu.	2,009	50	0.550	0.181	0.097	0.085	0.012	0.020	101,000	0.826
Median	2,010	99	0.600	0.301	0.216	0.142	0.044	0.059	237,300	0.985
Mean	2,010	99	0.624	0.309	0.237	0.231	0.088	0.060	3,943,000,000,000	1.010
3rd Qu.	2,010	148	0.730	0.414	0.345	0.298	0.098	0.100	621,200	1.139
Max.	2,011	197	1	0.883	0.837	0.999	0.989	0.305	307,700,000,000,000	3.163

Table 6: Statistics Of the Accounting Data (By Year)

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,004	1	0.140	0.010	0.010	0.001	0	-0.801	8,206	0.220
1st Qu.	2,006	50	0.550	0.142	0.130	0.077	0.013	0.033	96,220	0.908
Median	2,008	99	0.615	0.251	0.245	0.140	0.044	0.068	223,500	1.046
Mean	2,008	99	0.638	0.269	0.260	0.218	0.091	0.072	3,696,000,000,000	1.070
3rd Qu.	2,009	148	0.750	0.381	0.363	0.288	0.103	0.110	599,400	1.184
Max.	2,011	197	1	0.883	0.940	0.999	0.989	0.537	324,000,000,000,000	4.139

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,004	1	0.530	0.010	0.010	0.001	0	-0.801	8,206	0.220
1st Qu.	2,005	50	0.600	0.128	0.116	0.085	0.015	0.037	115,300	0.918
Median	2,007	103	0.650	0.230	0.224	0.140	0.047	0.073	281,300	1.055
Mean	2,007	100.600	0.689	0.242	0.235	0.220	0.095	0.078	4,533,000,000,000	1.070
3rd Qu.	2,009	150	0.750	0.346	0.336	0.288	0.105	0.114	927,900	1.185
Max.	2,011	197	1	0.787	0.796	0.999	0.989	0.345	324,000,000,000,000	3.083

	Year	Company	Score	Leverage	Debt.Ratio	Liquidity.Ratio	Activity.Ratio	Profitability.Ratio	Size	Growth.Rate
Min.	2,004	2	0.140	0.010	0.018	0.003	0.00001	-0.545	8,386	0.291
1st Qu.	2,006	53	0.350	0.246	0.228	0.056	0.007	0.017	68,870	0.856
Median	2,008	84	0.450	0.391	0.362	0.105	0.031	0.055	108,400	1.015
Mean	2,008	91.900	0.413	0.392	0.370	0.209	0.074	0.047	263,100	1.068
3rd Qu.	2,010	140	0.500	0.506	0.495	0.300	0.092	0.082	200,800	1.175
Max.	2,011	197	0.520	0.883	0.940	0.958	0.733	0.537	8,087,000	4.139

Table 7: Statistics Of the Accounting Data (By Investment Grade and Non-Investment Grade)

	2004			2005			2006			2007		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.7685 *** *(0.0518)*			0.8150 *** *(0.0525)*			0.7358 *** *(0.0435)*			0.7683 *** *(0.0354)*		
Leverage	0.2410 * *(0.1499)*	3.1130 *(2.1954)*	1.8176 *(1.2103)*	0.3183 *** *(0.1374)*	4.1024 ** *(1.8104)*	2.2532 ** *(1.0343)*	0.2932 ** *(0.1266)*	3.8845 ** *(1.7120)*	1.9234 ** *(0.9848)*	-0.0163 *(0.0365)*	-0.4249 *(0.4850)*	-0.2152 *(0.2905)*
Debt Ratio	-0.7176 *** *(0.1791)*	-9.3614 *** *(2.6164)*	-5.6122 *** *(1.4680)*	-0.7610 *** *(0.1664)*	-9.7475 *** *(2.1937)*	-5.5785 *** *(1.2748)*	-0.6590 *** *(0.1446)*	-8.6144 *** *(2.0518)*	-4.6957 *** *(1.1494)*	-0.3582 *** *(0.0781)*	-4.7062 *** *(1.1298)*	-2.6613 *** *(0.6366)*
Liquidity Ratio	0.0001 *(0.0003)*	0.0012 *(0.0036)*	0.0005 *(0.0023)*	0.0001 *(0.0003)*	0.0016 *(0.0027)*	0.0009 *(0.0019)*	0.0027 *(0.0044)*	0.0501 *(0.0580)*	0.0272 *(0.0333)*	0.0011 *(0.0017)*	0.0157 *(0.0271)*	0.0131 *(0.0135)*
Activity Ratio	0.0589 *** *(0.0092)*	1.0276 *** *(0.1875)*	0.5441 *** *(0.0981)*	0.0505 *** *(0.0111)*	0.8043 *** *(0.1677)*	0.4057 *** *(0.0909)*	0.0546 *** *(0.0097)*	0.9079 *** *(0.1928)*	0.4365 *** *(0.0806)*	0.0980 *** *(0.0133)*	1.6229 *** *(0.2610)*	0.8365 *** *(0.1239)*
Profitability Ratio	0.5300 *** *(0.1735)*	7.4548 *** *(2.5790)*	4.5146 *** *(1.4240)*	0.3529 *** *(0.1756)*	5.3667 ** *(2.5482)*	2.7853 ** *(1.3154)*	0.3936 *** *(0.1368)*	7.4193 *** *(2.1295)*	2.9949 *** *(1.0601)*	0.4697 *** *(0.1264)*	6.8907 *** *(1.7473)*	3.8828 *** *(1.0194)*
Size	1.13E-15 *** *(4.93E-16)*	2.47E-14 *** *(1.03E-14)*	1.38E-14 *** *(6.41E-15)*	9.13E-16 *** *(4.03E-16)*	1.69E-14 *** *(6E-15)*	8.79E-15 ** *(3.6E-15)*	1.2E-15 *** *(3.32E-16)*	2E-14 *** *(5.16E-15)*	1.03E-14 *** *(2.79E-15)*	1.04E-15 *** *(3.13E-16)*	1.69E-14 *** *(4.93E-15)*	9.77E-15 *** *(2.78E-15)*
Growth Rate	-0.0278 *(0.0356)*	-0.2157 *(0.4719)*	-0.1896 *(0.2844)*	-0.0552 *(0.0366)*	-0.6515 *(0.4917)*	-0.4235 *(0.2725)*	-0.0138 *(0.0311)*	-0.1587 *(0.4573)*	-0.1158 *(0.2377)*	-0.0690 *** *(0.0259)*	-0.8749 ** *(0.4035)*	-0.4789 ** *(0.2077)*
R^2	0.3449	0.0844	0.0848	0.2634	0.0612	0.0594	0.3175	0.0728	0.0712	0.3797	0.0901	0.0906
Adj R^2	0.3207	0.0507	0.0511	0.2361	0.0266	0.0247	0.2922	0.0386	0.0370	0.3567	0.0566	0.0571

Table 8: Regression Results of Accounting Ratios to Credit Scores (2004-2007)

	2008			2009			2010			2011		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.6787 *** *(0.0319)*			0.8276 *** *(0.0389)*			0.8183 *** *(0.0408)*			0.6940 *** *(0.0388)*		
Leverage	-0.4385 *** *(0.1302)*	-6.4 *** *(2.1008)*	-3.4531 *** *(1.1551)*	-0.7042 *** *(0.1213)*	-10.655 *** *(1.9112)*	-5.9393 *** *(1.0867)*	-0.717 *** *(0.1132)*	-11.0198 *** *(1.7461)*	-6.1093 *** *(1.0101)*	-0.4965 *** *(0.1203)*	-7.1961 *** *(1.742)*	-4.0721 *** *(1.0262)*
Debt Ratio	-0.0216 *(0.1239)*	-0.148 *(1.9708)*	-0.3152 *(1.0763)*	0.1665 *(0.1129)*	2.5924 *(1.6512)*	1.4146 *(0.9682)*	0.2352 ** *(0.1064)*	3.9901 *** *(1.5281)*	2.0468 ** *(0.9068)*	0.0125 *(0.1146)*	0.4187 *(1.6001)*	0.0196 *(0.9504)*
Liquidity Ratio	0.0018 *(0.0015)*	0.033 *(0.021)*	0.0158 *(0.013)*	0.0001 *(0.002)*	-0.0021 *(0.0268)*	-0.0012 *(0.017)*	-0.0017 *(0.0029)*	-0.0234 *(0.0435)*	-0.0176 *(0.0247)*	-0.0063 * *(0.0036)*	-0.0979 ** *(0.0492)*	-0.0546 * *(0.0299)*
Activity Ratio	0.0735 *** *(0.0106)*	1.1807 *** *(0.1957)*	0.6235 *** *(0.099)*	0.0664 *** *(0.0095)*	1.1589 *** *(0.2113)*	0.5792 *** *(0.0863)*	0.0468 *** *(0.0086)*	0.8461 *** *(0.1527)*	0.4118 *** *(0.0774)*	0.0293 *** *(0.008)*	0.5202 *** *(0.1348)*	0.2494 *** *(0.0688)*
Profitability Ratio	0.3109 *** *(0.0739)*	4.7082 *** *(1.2575)*	2.6241 *** *(0.6434)*	0.711 *** *(0.1284)*	11.0222 *** *(2.0372)*	6.2639 *** *(1.1294)*	0.6358 *** *(0.1526)*	10.6349 *** *(2.406)*	5.5408 *** *(1.3148)*	0.3576 *** *(0.1334)*	5.8889 *** *(2.0165)*	3.2296 *** *(1.1131)*
Size	1.21E-15 *** *(3.39E-16)*	2.15E-14 *** *(5.95E-15)*	1.14E-14 *** *(3.19E-15)*	4.97E-16 *(3.18E-16)*	1.01E-14 ** *(4.64E-15)*	4.41E-15 *(2.75E-15)*	1.05E-15 *** *(3.35E-16)*	1.86E-14 *** *(5.14E-15)*	8.56E-15 *** *(2.88E-15)*	5.52E-16 * *(3.2E-16)*	9.75E-15 ** *(4.65E-15)*	4.43E-15 * *(2.65E-15)*
Growth Rate	0.0827 *** *(0.0357)*	1.1057 *** *(0.5355)*	0.718 *** *(0.3064)*	-0.0724 *** *(0.0258)*	-0.971 *** *(0.3749)*	-0.6557 *** *(0.2209)*	-0.0872 *** *(0.0316)*	-1.2738 *** *(0.4534)*	-0.7487 *** *(0.268)*	0.044 *(0.036)*	0.7079 *(0.5075)*	0.4274 *(0.2971)*
R^2	0.4903	0.0994	0.1004	0.5006	0.1064	0.1059	0.4283	0.0921	0.0908	0.3605	0.0707	0.0745
Adj R^2	0.4727	0.0682	0.0692	0.4833	0.0754	0.0749	0.4085	0.0604	0.0593	0.3383	0.0385	0.0424

Table 9: Regression Results of Accounting Ratios to Credit Scores (2008-2011)

	2004			2005			2006			2007		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.7792 *** *(0.0444)*			0.8348 *** *(0.0441)*			0.7247 *** *(0.0456)*			0.7622 *** *(0.0376)*		
Leverage	0.0219 *(0.1322)*	0.2130 *(2.4803)*	0.1615 *(1.3382)*	0.0553 *(0.1205)*	0.9236 *(2.0903)*	0.1379 *(1.1646)*	0.1691 *(0.1145)*	2.5626 *(1.8812)*	1.2773 *(1.1002)*	-0.0206 *(0.0402)*	-0.6300 *(0.6841)*	-0.3411 *(0.3966)*
Debt Ratio	-0.3380 ** *(0.1619)*	-5.3503 * *(2.8992)*	-3.4128 ** *(1.6475)*	-0.3630 ** *(0.1486)*	-5.9407 ** *(2.4924)*	-3.0491 ** *(1.4439)*	-0.4055 *** *(0.1348)*	-5.9480 *** *(2.2278)*	-3.4588 *** *(1.3092)*	-0.2169 *** *(0.0778)*	-3.0528 ** *(1.3063)*	-1.7675 ** *(0.7728)*
Liquidity Ratio	-2.45E-07 *(0.0002)*	6.66E06 *(0.0037)*	-0.0002 *(0.0023)*	0.0003 *(0.0002)*	0.0037 *(0.0028)*	0.0024 *(0.0019)*	0.0011 *(0.0038)*	0.0466 *(0.0648)*	0.0206 *(0.0365)*	0.0021 *(0.0014)*	0.0386 *(0.0309)*	0.0241 * *(0.0146)*
Activity Ratio	0.0525 *** *(0.0078)*	0.9794 *** *(0.1962)*	0.5741 *** *(0.1094)*	0.0509 ** *(0.0094)*	0.8335 *** *(0.1809)*	0.4857 *** *(0.1036)*	0.0489 *** *(0.0083)*	0.8536 *** *(0.1976)*	0.4497 *** *(0.0865)*	0.0776 *** *(0.0116)*	1.4093 *** *(0.2593)*	0.7452 *** *(0.1297)*
Profitability Ratio	0.1715 *(0.1626)*	2.6276 *(2.9447)*	1.7487 *(1.6448)*	0.2007 *(0.1703)*	2.7154 *(2.9787)*	1.4948 *(1.6465)*	0.2976 ** *(0.1479)*	5.5323 ** *(2.5786)*	3.0887 ** *(1.4259)*	0.3045 ** *(0.1512)*	5.8505 ** *(2.7285)*	3.3503 ** *(1.4977)*
Size	1.1E-15 *** *(3.99E-16)*	2.42E-14 ** *(1.03E-14)*	1.37E-14 ** *(6.4E-15)*	8.77E-16 *** *(3.16E-16)*	1.7E-14 *** *(5.99E-15)*	9.37E-15 *** *(3.61E-15)*	1.02E-15 *** *(2.78E-16)*	1.89E-14 *** *(5.05E-15)*	1.02E-14 *** *(2.9E-15)*	9.13E-16 *** *(2.63E-16)*	1.64E-14 *** *(4.83E-15)*	9.47E-15 *** *(2.89E-15)*
Growth Rate	-0.0325 (0.0304)	-0.3136 (0.4984)	-0.2658 (0.3063)	-0.0750 *** (0.0302)	-1.1269 ** (0.5604)	-0.7964 *** (0.2943)	-0.0028 (0.0338)	0.0295 (0.5446)	-0.0360 (0.3247)	-0.0509 * (0.0286)	-0.8377 * (0.4868)	-0.5224 * (0.2865)
R^2	0.3294	0.0822	0.0832	0.2815	0.0658	0.0679	0.2791	0.0638	0.0649	0.3261	0.0753	0.0769
Adj R^2	0.2999	0.0420	0.0431	0.2493	0.0362	0.0384	0.2469	0.0221	0.0232	0.2963	0.0343	0.0360

Table 10: Regression Results of Investment Grade Corporations Accounting Ratios to Credit Scores (2004-2007)

	2008			2009			2010			2011		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.6474 *** *(0.0283)*			0.7435 *** *(0.039)*			0.7809 *** *(0.0411)*			0.6687 *** *(0.0345)*		
Leverage	0.1645 *(0.1414)*	3.2919 *(2.8446)*	1.9057 *(1.616)*	-0.1097 *(0.1498)*	-2.2923 *(2.7851)*	-1.4274 *(1.5343)*	-0.2177 * *(0.1323)*	-4.9620 ** *(2.5652)*	-3.1185 ** *(1.4283)*	0.02 *(0.1275)*	0.2477 *(2.3701)*	0.0452 *(1.3286)*
Debt Ratio	-0.3615 *** *(0.133)*	-6.6547 ** *(2.7905)*	-3.803 *** *(1.5167)*	-0.115 *(0.1344)*	-1.3033 *(2.527)*	-0.7347 *(1.381)*	0.0526 *(0.1172)*	2.0657 *(2.3423)*	1.3572 *(1.2678)*	-0.1828 *(0.1154)*	-2.9833 *(2.1854)*	-1.8662 *(1.2097)*
Liquidity Ratio	0.0001 *(0.0013)*	0.0097 *(0.0229)*	0.0019 *(0.014)*	-0.0009 *(0.0017)*	-0.0209 *(0.0267)*	-0.0121 *(0.0175)*	-0.0006 *(0.0024)*	-0.0192 *(0.0507)*	-0.0105 *(0.0261)*	-0.0074 ** *(0.003)*	-0.1211 ** *(0.0514)*	-0.0745 ** *(0.0312)*
Activity Ratio	0.0657 *** *(0.0088)*	1.1466 *** *(0.1994)*	0.6207 *** *(0.1031)*	0.0533 *** *(0.0081)*	0.9144 *** *(0.1833)*	0.5027 *** *(0.0885)*	0.042 *** *(0.0076)*	0.7562 *** *(0.1595)*	0.425 *** *(0.0861)*	0.0331 *** *(0.0073)*	0.5844 *** *(0.1578)*	0.3306 *** *(0.08)*
Profitability Ratio	0.1391 * *(0.0774)*	3.4193 ** *(1.5762)*	1.9284 ** *(0.9396)*	0.4378 *** *(0.1389)*	8.2901 *** *(2.4439)*	4.8985 *** *(1.4471)*	0.4801 *** *(0.1742)*	9.2951 *** *(3.2497)*	6.0642 *** *(1.8852)*	0.0742 *(0.1333)*	2.0994 *(2.6043)*	1.6133 *(1.3953)*
Size	8.62E-16 *** *(2.8E-16)*	1.89E-14 *** *(6.06E-15)*	1.05E-14 *** *(3.75E-15)*	7.36E-16 *** *(2.69E-16)*	1.36E-14 *** *(4.55E-15)*	6.58E-15 ** *(2.79E-15)*	8.51E-16 *** *(2.79E-16)*	1.59E-14 *** *(4.96E-15)*	8.35E-15 *** *(3E-15)*	3.93E-16 *(2.61E-16)*	6.77E-15 *(4.45E-15)*	3.65E-15 *(2.71E-15)*
Growth Rate	0.0601 * *(0.0309)*	0.9061 *(0.6039)*	0.5938 * *(0.3335)*	-0.0487 * *(0.0276)*	-0.7268 *(0.4658)*	-0.5132 * *(0.2842)*	-0.0986 *** *(0.0345)*	-1.594 ** *(0.6805)*	-0.9785 *** *(0.3689)*	0.0241 *(0.0327)*	0.339 *(0.5816)*	0.3134 *(0.3424)*
R^2	0.385	0.0756	0.0714	0.3072	0.06	0.0576	0.2651	0.0543	0.0536	0.2045	0.0395	0.041
Adj R^2	0.3576	0.0344	0.0300	0.2761	0.0178	0.0153	0.2315	0.0110	0.0103	0.169	-0.0033	-0.0018

Table 11: Regression Results of Investment Grade Corporations Accounting Ratios to Credit Scores (2008-2011)

	2004			2005			2006			2007		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.4507 ***			0.4084 ***			0.4686 ***			0.5357 ***		
	(0.0866)			*(0.0917)*			*(0.0496)*			*(0.0574)*		
Leverage	0.4625	13.3260	7.7920	0.4628 **	15.5514 ***	7.8678 **	0.3473	5.7202	4.9270	0.0120	0.1979	-0.5199
	(0.3259)	*(10.6564)*	*(5.8754)*	*(0.2083)*	*(5.9818)*	*(3.3330)*	*(0.2234)*	*(5.6115)*	*(3.2201)*	*(0.2133)*	*(6.5325)*	*(3.7522)*
Debt Ratio	-0.6904 *	-20.7071 *	-12.3819 *	-0.5506 **	-18.4105 ***	-9.6850 **	-0.4183 *	-9.0099	-5.9981 *	-0.2326	-6.1861	-3.0171
	(0.3497)	*(11.6910)*	*(6.4487)*	*(0.2564)*	*(7.2457)*	*(4.1015)*	*(0.2443)*	*(5.9429)*	*(3.5478)*	*(0.2556)*	*(7.6904)*	*(4.3350)*
Liquidity Ratio	-0.0332	-1.3585	-0.8163	0.0034 *	0.1178 **	0.0573 **	-0.0003	-0.1617	-0.0784	-0.0028	-0.1348	-0.0733
	(0.0297)	*(0.9138)*	*(0.5338)*	*(0.0017)*	*(0.0489)*	*(0.0272)*	*(0.0083)*	*(0.2043)*	*(0.1214)*	*(0.0061)*	*(0.1825)*	*(0.1010)*
Activity Ratio	-0.0193	-2.7848	-1.6539	-0.1061 *	-3.1860 **	-1.4815 **	0.2083	6.0730	3.2272	1.1200 ***	35.2556 ***	20.8877 ***
	(0.1883)	*(5.5947)*	*(3.3280)*	*(0.0553)*	*(1.4075)*	*(0.8596)*	*(0.1250)*	*(4.5107)*	*(2.4388)*	*(0.3985)*	*(13.5528)*	*(7.0740)*
Profitability Ratio	0.2097	9.4365	5.4909	0.1934	8.3522	3.0150	0.2053	13.6387 **	2.6133	0.0411	1.1378	0.6698
	(0.2329)	*(8.5703)*	*(4.3415)*	*(0.1694)*	*(6.0457)*	*(2.6339)*	*(0.1353)*	*(6.3619)*	*(1.9701)*	*(0.1161)*	*(3.5097)*	*(1.9637)*
Size	2.11E-09	1.44E-06	8.56E-07	6.04E-08 *	1.86E-06 **	8.47E-07	-8.34E-08 *	-2.49E-06	-1.31E-06	-2.03E-07 ***	-6.4E-06 ***	-3.81E-06 ***
	(1.19E07)	*(3.53E06)*	*(2.1E06)*	*(3.44E-08)*	*(8.62E07)*	*(5.3E07)*	*(4.52E-08)*	*(1.67E06)*	*(8.95E07)*	*(5.8E08)*	*(2.03E06)*	*(1.12E06)*
Growth Rate	0.0729	2.0726	1.3098	0.0552	1.5829	0.8227	-0.0017	-0.2263	0.0124	-0.0375	-0.7044	-0.3514
	(0.0562)	*(1.8546)*	*(1.0110)*	*(0.0687)*	*(1.6735)*	*(1.0468)*	*(0.0270)*	*(0.6794)*	*(0.3790)*	*(0.0264)*	*(0.6045)*	*(0.3815)*
R^2	0.4290	0.1467	0.1616	0.3105	0.1130	0.0926	0.3842	0.1377	0.1123	0.5203	0.1992	0.2058
Adj R^2	0.2473	-0.1248	-0.1052	0.1174	-0.1258	-0.1517	0.2046	-0.1037	-0.1363	0.3743	-0.0344	0.0152

Table 12: Regression Results of Non-Investment Grade Corporations Accounting Ratios to Credit Scores (2004-2007)

	2008			2009			2010			2011		
Variable	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit	Linear	Logit	Probit
Intercept	0.5537 *** *(0.057)*			0.6724 *** *(0.0862)*			0.5822 *** *(0.0613)*			0.6086 *** *(0.0571)*		
Leverage	-0.4103 ** *(0.1636)*	-10.6271 *** *(3.8102)*	-6.1521 *** *(2.1845)*	-0.5991 *** *(0.2064)*	-11.2991 *** *(3.8789)*	-6.6876 *** *(2.3113)*	-0.4918 *** *(0.1654)*	-13.1929 *** *(4.321)*	-7.5337 *** *(2.3123)*	-0.4382 *** *(0.1628)*	-13.2184 *** *(5.0451)*	-6.7 *** *(2.434)*
Debt Ratio	0.0417 *(0.1411)*	3.0088 *(2.9569)*	1.7913 *(1.816)*	0.1298 *(0.1517)*	2.7654 *(2.7346)*	1.6804 *(1.6307)*	0.0813 *(0.1408)*	4.0186 *(3.599)*	2.2554 *(1.8868)*	0.0174 *(0.1404)*	2.8857 *(3.9233)*	0.58 *(1.9857)*
Liquidity Ratio	0.0015 *(0.0038)*	-0.0184 *(0.0909)*	0.0043 *(0.0494)*	0.0106 *(0.0101)*	0.2177 *(0.1859)*	0.1252 *(0.1095)*	0.0107 *(0.0128)*	0.3112 *(0.3344)*	0.1612 *(0.1713)*	0.0008 *(0.0089)*	0.0557 *(0.2153)*	0.0078 *(0.1243)*
Activity Ratio	0.0431 *(0.0495)*	0.6722 *(1.0467)*	0.411 *(0.6333)*	0.1681 * *(0.0944)*	3.1507 * *(1.6524)*	2.0407 ** *(1.028)*	0.0176 *(0.0167)*	0.4251 *(0.4231)*	0.2683 *(0.2215)*	0.0021 *(0.0104)*	-0.0231 *(0.2231)*	0.0012 *(0.1456)*
Profitability Ratio	0.1813 ** *(0.0869)*	4.0455 *** *(2.0326)*	2.4962 ** *(1.1341)*	0.4062 * *(0.2071)*	6.8934 * *(3.7393)*	4.4601 ** *(2.2337)*	-0.0062 *(0.1702)*	1.0682 *(3.704)*	0.2794 *(2.2331)*	-0.1327 *(0.1661)*	-1.734 *(3.7614)*	-0.5394 *(2.3611)*
Size	-6.56E-08 *(4.26E-08)*	-7.1E-07 *(9.12E-07)*	-3.64E-07 *(5.63E-07)*	-7.6E-08 *(5.79E-08)*	-8.25E-07 *(9.82E-07)*	-4.51E-07 *(6.21E-07)*	7.19E-09 *(4.94E-08)*	3.91E-07 *(1.08E-06)*	3.3E-07 *(6.55E-07)*	7.13E-08 *(4.63E-08)*	1.72E-06 * *(1.07E-06)*	9.4E-07 *(6.65E-07)*
Growth Rate	0.0644 *(0.0674)*	0.4125 *(1.3943)*	0.586 *(0.8566)*	-0.0515 *(0.0394)*	-0.9929 *(0.8411)*	-0.5538 *(0.4287)*	0.0074 *(0.0324)*	0.1984 *(0.6712)*	0.0432 *(0.4285)*	-0.0124 *(0.047)*	0.3498 *(1.2018)*	0.1946 *(0.7032)*
R^2	0.4607	0.0983	0.0992	0.3702	0.0716	0.0733	0.4821	0.1145	0.1185	0.5129	0.1321	0.141
Adj R^2	0.3587	-0.0723	-0.0712	0.2542	-0.0994	-0.1271	0.3937	-0.0367	-0.0320	0.4208	-0.0321	-0.0215

Table 13: Regression Results of Non-Investment Grade Corporations Accounting Ratios to Credit Scores (2008-2001)

	2004-2011					2004-2006					2007-2011				
	Pooling	Fixed Effect	Random Effect	Logit	Probit	Pooling	Fixed Effect	Random Effect	Logit	Probit	Pooling	Fixed Effect	Random Effect	Logit	Probit
Intercept	0.6932 ***	0.6508 ***	0.8082 ***			0.7684 ***	0.6742 ***	0.8333 ***			0.6923 ***	0.6513 ***	0.7769 ***		
	(0.0125)	*(0.0062)*	*(0.0882)*			*(0.0274)*	*(0.0107)*	*(0.0707)*			*(0.0144)*	*(0.0064)*	*(0.0677)*		
Leverage	-0.037 ***	-0.0324 ***	-0.0803	-0.666 ***	-0.3079 ***	0.2782 ***	0.1059 ***	0.3493 **	3.9074 ***	1.9973 ***	-0.0490	-0.0170 ***	-0.1637 ***	-0.8644 ***	-0.4017 ***
	(0.0137)	*(0.0068)*	*(0.0825)*	*(0.2120)*	*(0.1050)*	*(0.0770)*	*(0.0421)*	*(0.1462)*	*(1.0728)*	*(0.6065)*	*(0.0163)*	*(0.0078)*	*(0.0572)*	*(0.2527)*	*(0.1269)*
Debt Ratio	-0.2928 ***	-0.0304 *	-0.3296 ***	-3.6449 ***	-2.1527 ***	-0.6936 ***	-0.1780 ***	-0.8340 ***	-9.3096 ***	-5.1879 ***	-0.2692 ***	0.0052	-0.2201 ***	-3.3024 ***	-1.9775 ***
	(0.0262)	*(0.0184)*	*(0.1120)*	*(0.3824)*	*(0.2057)*	*(0.0907)*	*(0.0500)*	*(0.1722)*	*(1.2898)*	*(0.7278)*	*(0.0313)*	*(0.0213)*	*(0.0834)*	*(0.4674)*	*(0.2483)*
Liquidity Ratio	4.87E-05	1.08E-05	0.0002	0.0006	0.0003	0.0001	0.0001 *	0.0001	0.0011	0.0006	0.0001	-0.0007	0.0015	-0.0035	0.0009
	(0.0002)	*(0.0001)*	*(0.0013)*	*(0.0021)*	*(0.0014)*	*(0.0002)*	*(0.0001)*	*(0.0005)*	*(0.0021)*	*(0.0014)*	*(0.0010)*	*(0.0004)*	*(0.0041)*	*(0.0139)*	*(0.0076)*
Activity Ratio	0.0593 ***	0.0009	0.079 ***	7.0936 ***	0.4624 ***	0.0546 ***	0.0038	0.0608 ***	0.8972 ***	0.4517 ***	0.0604 ***	-0.0025	0.0780 ***	1.0013 ***	0.4640 ***
	(0.0036)	*(0.0034)*	*(0.0100)*	*(0.6415)*	*(0.0298)*	*(0.0057)*	*(0.0053)*	*(0.0100)*	*(0.1036)*	*(0.0504)*	*(0.0045)*	*(0.0038)*	*(0.0099)*	*(0.0883)*	*(0.0373)*
Profitability Ratio	0.4881 ***	0.1985 ***	0.8588 ***	0.9645 ***	3.7608 ***	0.4118 ***	0.1645 ***	0.4921 ***	6.8615 ***	3.2600 ***	0.5274 ***	0.0867 ***	1.0277 ***	7.7364 ***	4.1048 ***
	(0.0416)	*(0.0232)*	*(0.1741)*	*(0.0671)*	*(0.3266)*	*(0.0899)*	*(0.0456)*	*(0.1747)*	*(1.3704)*	*(0.7064)*	*(0.0517)*	*(0.0247)*	*(0.1563)*	*(0.8167)*	*(0.4126)*
Size	1.03E-15 ***	-1.28E-16	1.14E-15 ***	1.57E-14 ***	8.42E-15 ***	1.08E-15 ***	-2.31E-17	1.19E-15 ***	1.9E-14 ***	1E-14 ***	9.81E-16 ***	1.54E-16	1.08E-15 ***	1.43E-14 ***	7.74E-15 ***
	(1.26E-16)	*(2.37E-16)*	*(3.26E-16)*	*(1.85E-15)*	*(1.03E-15)*	*(2.21E-16)*	*(1.92E-16)*	*(3.88E-16)*	*(3.54E-15)*	*(2.01E-15)*	*(1.52E-16)*	*(4.24E-16)*	*(3.12E-16)*	*(2.16E-15)*	*(1.23E-15)*
Growth Rate	-0.0252 **	-0.0101 *	-0.1445 *	-0.2785 **	-0.1968 ***	-0.0308	-0.0087	-0.0736	-0.3313	-0.2381	-0.0371 ***	-0.0225 ***	-0.1358 **	-0.4581 ***	-0.2878 ***
	(0.0105)	*(0.0047)*	*(0.0827)*	*(0.1427)*	*(0.0801)*	*(0.0193)*	*(0.0062)*	*(0.0541)*	*(0.2665)*	*(0.1493)*	*(0.0126)*	*(0.0048)*	*(0.0669)*	*(0.1723)*	*(0.0978)*
R^2	0.3019	0.0931	0.2698	0.0592	0.059	0.3023	0.1614	0.2983	0.0698	0.0685	0.3223	0.0559	0.2908	0.0603	0.0603
Adj R^2	0.2987	0.0896	0.267	0.0556	0.0554	0.2940	0.1528	0.2911	0.0602	0.0589	0.3175	0.0501	0.2864	0.0545	0.0545

Table 14: Regression Results of Panel Accounting Data

Statistic	Rating	Mean	St. Dev.	Min	Max
PX_LAST		37.448	9.510	12.990	65.950
PX_BID	AAA	35.665	9.248	11.530	62.740
PX_ASK		39.236	9.799	14.450	69.160
PX_LAST		61.432	27.745	12.927	190.809
PX_ASK	AA	60.365	28.773	11.232	194.783
PX_BID		62.505	26.882	14.115	186.833
PX_LAST		63.679	33.952	10.167	290.000
PX_ASK	AA-	61.431	33.045	8.434	282.813
PX_BID		65.923	34.996	11.160	297.188
PX_LAST		75.543	44.424	19.393	590.789
PX_ASK	A+	72.318	42.184	17.142	564.661
PX_BID		78.777	46.908	21.391	616.916
PX_LAST		93.906	71.730	14.353	687.104
PX_ASK	A	91.606	70.791	12.020	681.316
PX_BID		96.205	72.780	16.684	692.891
PX_LAST		120.832	85.359	21.505	696.856
PX_ASK	A-	118.753	84.340	19.960	680.242
PX_BID		122.899	86.610	23.050	713.470
PX_LAST		122.222	88.604	31.273	929.386
PX_ASK	BBB+	118.904	86.306	26.879	902.990
PX_BID		125.543	91.045	34.598	964.330
PX_LAST		158.941	103.540	31.434	1,298.611
PX_ASK	BBB	154.762	101.089	28.364	1,248.312
PX_BID		163.124	106.066	32.787	1,348.910
PX_LAST		172.274	110.508	36.635	1,543.817
PX_ASK	BBB-	168.315	107.886	34.535	1,489.898
PX_BID		176.234	113.283	38.736	1,597.736
PX_LAST		289.721	193.666	48.553	1,972.479
PX_BID	BB+	282.103	188.311	46.364	1,907.850
PX_ASK		297.332	199.049	50.405	2,037.107
PX_LAST		309.619	199.260	51.619	1,660.993
PX_BID	BB	301.391	193.565	49.098	1,610.074
PX_ASK		317.833	204.988	54.141	1,711.912
PX_LAST		423.314	231.583	29.447	1,735.296
PX_BID	BB-	413.431	226.330	27.784	1,708.415
PX_ASK		433.175	236.809	31.109	1,777.215
PX_LAST		576.303	298.849	152.576	2,568.295
PX_ASK	B+	562.078	290.392	147.492	2,494.015
PX_BID		590.534	307.401	157.660	2,642.575
PX_LAST		789.877	415.043	193.222	3,309.824
PX_ASK	B	768.528	399.755	186.299	3,140.742
PX_BID		811.514	431.107	200.146	3,496.217
PX_LAST		1,087.992	607.673	257.500	3,974.826
PX_BID	B-	1,055.841	584.599	249.125	3,616.623
PX_ASK		1,120.033	629.842	265.875	3,974.826
PX_LAST		1,347.919	1,342.924	132.139	9,580.198
PX_BID	CCC+	1,309.431	1,300.437	128.212	9,580.198
PX_ASK		1,389.203	1,391.435	136.066	9,661.282
PX_LAST		1,234.540	1,012.121	95.997	9,158.865
PX_BID	CCC	1,197.341	968.938	91.083	7,952.916
PX_ASK		1,269.413	1,045.610	100.910	9,298.397

Table 15: Statistics Summary of 5 year CDS Last Price, BID and ASK Price by Ratings

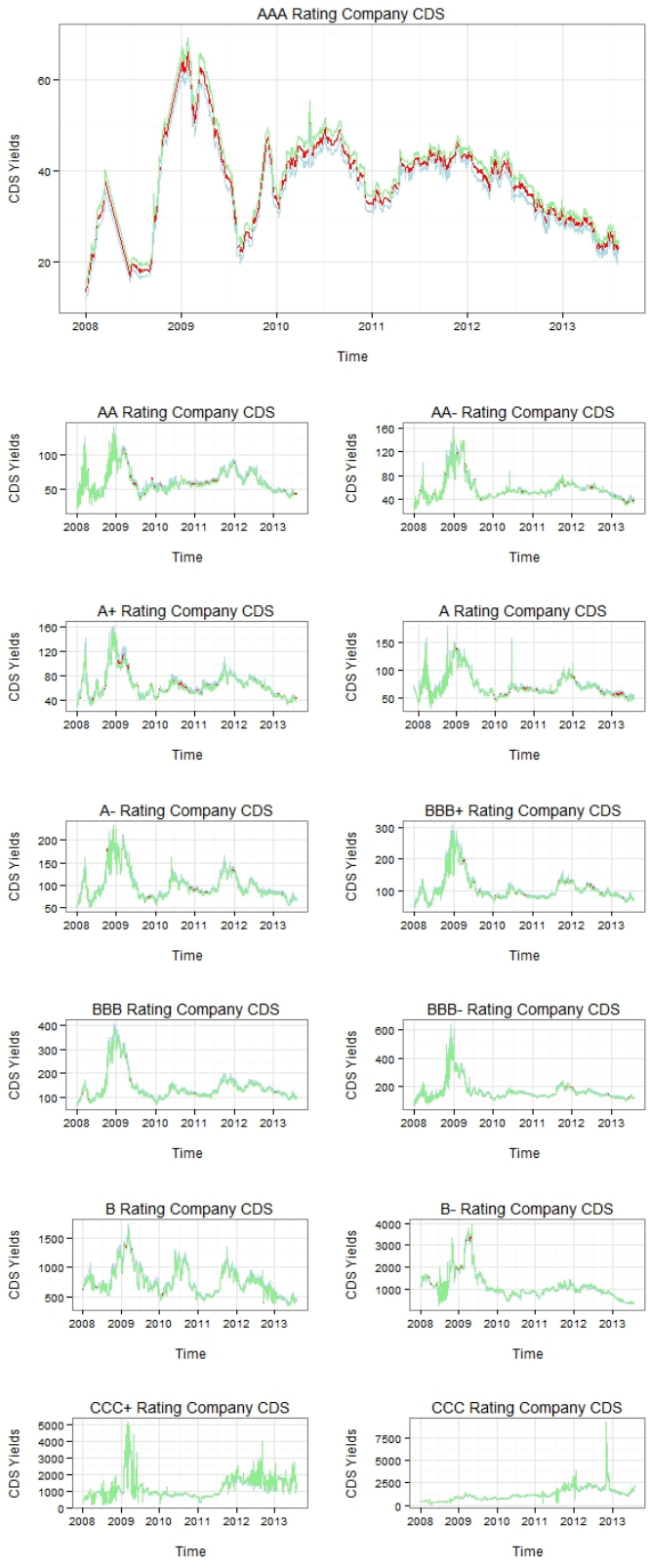

Figure 4: History 5 year CDS Last Price, BID and ASK Price by Ratings

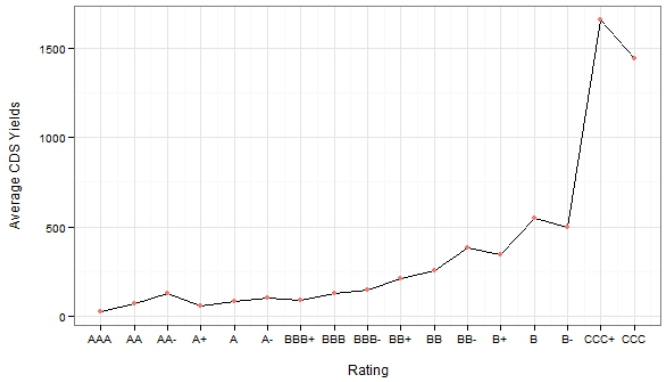

Figure 5: Average 5 year CDS Last Price (2013 1st. July - 31 Dec.

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	Std.
2012	-0.28860	-0.07380	-0.01246	0.00000	0.07724	0.33010	0.09735615
2013	-0.275200	-0.079680	-0.016570	-0.004204	0.072800	0.344100	0.09686277

Table 16: Difference between the accounting based score and S&P's rating scores

Statistic	N	Mean	St. Dev.	Min	Max
Campany	197				
S& P Rating Score		0.636	0.148	0.205	1.000
Accounting Score w		0.727	0.065	0.619	0.948
Accounting Credit Score		0.628	0.088	0.305	0.872
CDS Score		0.623	0.105	0.214	0.762
δ-Score		0.627	0.090	0.298	0.844

Table 17: Statistics of Credit Scores and weights(2013)